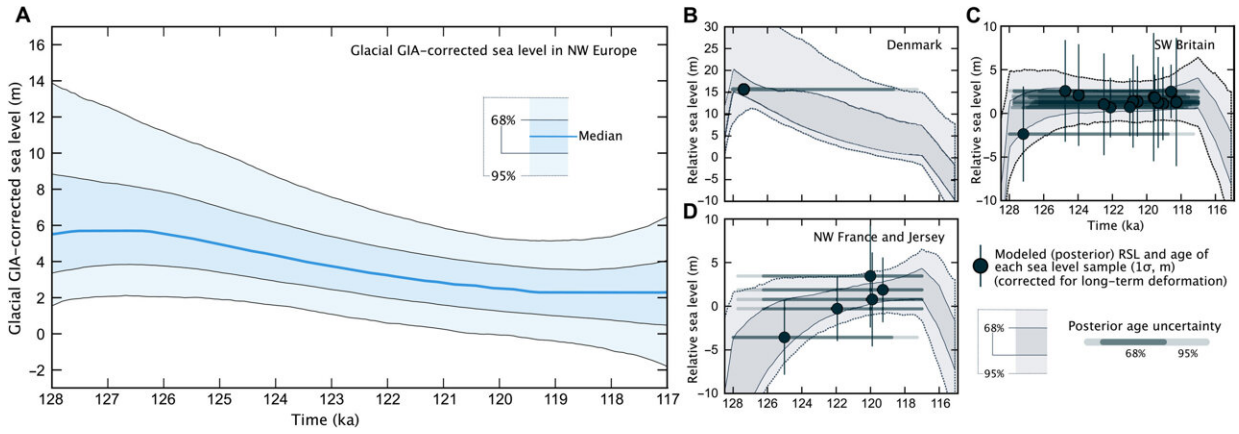
# Fossilized beaches help scientists understand impacts of past global warming

July 5 2023, by Alan Williams




LIG sea-level highstand in NW Europe.(**A**) Estimated LIG sea level in NW Europe after accounting for long-term deformation and glacial GIA, showing the median (solid blue line) posterior estimate of the Bayesian inversion along with the central 68% (darker shading) and 95% (lighter shading) probabilities. This quantity is only inferred for the time range 128 to 117 ka (see Materials and Methods). (**B** to **D**) Local sea-level model posteriors [shading showing central 68 and 95% probabilities, as in (A)] for specific regions in the database. Note that data elevations have been corrected for long-term uplift, and markers show the most likely posterior age. Credit: *Science Advances* (2023). DOI: 10.1126/sciadv.adf0198

Fossilized beaches along the UK coastline have enabled scientists to demonstrate for the first time how melting Antarctic ice sheets impacted global sea levels during a period of pronounced climate warming more

than 100,000 years ago.

A study developed at the University of Plymouth, and published in the journal *Science Advances*, analyzed ancient sediments from raised beaches in Cornwall, Devon and elsewhere across Western Europe.

The scientists involved in the research believe the raised beaches—characterized by flat surfaces, often with fossilized beach sands and stones, and typically found around 4–6 meters above current sea levels—could provide an invaluable insight into the local and global impacts of melting ice sheets in the future.

By combining new and existing data with a series of novel analysis and modeling techniques, the team of researchers from the UK, U.S. and Canada were able to demonstrate that the melting of the Antarctic ice sheet would have caused a rise in global sea levels of up to 5.7 meters.

They reached this conclusion after determining that the sea level change caused by the melting of northern hemisphere ice sheets was largely offset by the fact that removing an ice sheet causes the land near it to rebound. This meant the sea level change recorded on the beaches could only have come from Antarctica.

The researchers were also able to identify the timescale of this change as occurring between 116,000 and 129,000 years ago, ahead of the melting of any ice sheets in the northern hemisphere.

They believe the warmer polar temperatures during this interglacial period make it an important testing ground for understanding how ice sheets respond to warming.

Dr. Matt Telfer, Associate Professor of Physical Geography at the University of Plymouth and a co-author on the research, said, "The

South West of England is in a very fortuitous place when it comes to understanding this process. Our findings show that the English Channel is roughly neutral for sea-level change from the northern hemisphere, with the rising sea levels from melt and the rising land from the effects of rebound canceling each other out. As a result, the historic changes which saw sea levels along the UK coastline rise by up to six meters can be attributed solely to the melting of Antarctic ice."

Predictions suggest global temperatures will be 2°C warmer than pre-industrial levels by 2100, despite political agreements designed to keep the figure considerably lower.

In a report published in early 2022, the Intergovernmental Panel on Climate Change (IPCC) suggested this could lead to global sea level rises of 0.33 to 1.02 meters.

However, writing in the current study, researchers say there is significant uncertainty around the contribution of melting Antarctic ice to that figure since its fate is governed by more than warming temperatures alone.

Dr. Sarah Boulton, Associate Professor in Active and Neotectonics and also a co-author of the study, added, "We know that mass loss from the Greenland Ice Sheet and mountain glaciers track closely to temperature, so we can to some extent predict their fate and the impacts of that change. However, the stability of ice cliffs in the Antarctic is more poorly understood. How much the northern and southern hemispheres have, and will, contribute to future sea-level rise is a really big question when we are trying to understand future climate change. This study gives us some important clues as to how that might play out."

**More information:** Robert L. Barnett et al, Constraining the contribution of the Antarctic Ice Sheet to Last Interglacial sea level,

*Science Advances* (2023). DOI: 10.1126/sciadv.adf0198

Provided by University of Plymouth

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